CLAIMS

What is claimed is:

1. An apparatus for determining a Direction of Arrival (DOA) of a remote unit in a communication system, comprising:

a first antenna and a second antenna configured to receive an RF signal from the remote unit, said RF signal including a plurality of scattered rays produced by multi-path scattering;

a ray selector configured to identify a first ray from said scattered plurality of rays received at said first antenna and a second ray from said plurality of scattered rays received at said second antenna;

a difference calculator configured to determine an amplitude difference and a phase difference between said first ray and said second ray; and

an angle estimator configured to calculate a plurality of DOA values based at least in part upon said phase difference and select one of said plurality of DOA values utilizing said amplitude difference.

2. The apparatus of Claim 1, wherein a separation distance between said first antenna and said second antenna is greater than one-half of the wavelength of said RF signal.

3. The apparatus of Claim 1, further comprising a third antenna and a fourth antenna configured to receive said RF signal including said plurality of scattered rays produced by multi-path scattering.

4. The apparatus of Claim 3, wherein:

said ray selector is configured to identify a third ray from said scattered plurality of rays received at said third antenna and a fourth ray from said plurality of scattered rays received at said fourth antenna;

said difference calculator is configured to determine an second amplitude difference and a second phase difference between said third ray and said fourth ray; and

said angle estimator is configured to calculate a second plurality of DOA values based upon said second phase difference and select one of said second plurality of DOA values utilizing said second amplitude difference.

5. The apparatus of Claim 1, wherein the communication system is a code division multiple access (CDMA) communication system.

6. The apparatus of Claim 1, wherein said RF signal is an encoded spread-spectrum digital signal having a multiplicity of frequency and time overlapping coded signals from the remote unit and a plurality of remote units other than the remote unit.

7. The apparatus of Claim 1, wherein said first ray and said second ray are prompt rays.

8. The apparatus of Claim 1, wherein said difference calculator comprises:

a first magnitude calculator configured to calculate a first magnitude of said first ray;

a second magnitude calculator configured to calculate a second magnitude of said second ray; and

a magnitude difference calculator configured to receive said first magnitude and said second magnitude and produced said amplitude difference between said first ray and said second ray.

9. The apparatus of Claim 1, wherein said difference calculator comprises:

a first phase calculator configured to calculate a first phase of said first ray;

a second phase calculator configured to calculate a second phase of said second ray; and

a phase difference calculator configured to receive said first phase and said second phase and produced said phase difference between said first ray and said second ray.

10. The apparatus of Claim 1, wherein said angle estimator comprises a first DOA solution estimator that is configured to receive said amplitude difference and calculate a first DOA estimate.

11. The apparatus of Claim 10, wherein said angle estimator comprises a phase calibration computer that is configured to receive said first DOA estimate and directivity data of said first antenna and said second antenna and compute a phase calibration.

12. The apparatus of Claim 11, wherein said angle estimator comprises a phase difference calibrator that is configured to receive said phase calibration and said phase difference and compute a calibrated phase difference.

13. The apparatus of Claim 12, wherein said angle estimator comprises an ambiguous DOA solution generator that is configured to receive said calibrated phase difference and geometry data of said first antenna and said second antenna and calculate said plurality of DOA values.

14. The apparatus of Claim 13, wherein said angle estimator comprises a final DOA estimator that is configured to receive said plurality of DOA values and said first DOA estimate, said final DOA estimator selecting one of said second plurality of DOA values utilizing a comparison between said plurality DOA values and said first DOA estimate.

15. A method for determining a Direction of Arrival (DOA) of a remote unit in a communication system, comprising:

receiving an RF signal from the remote unit at a first antenna and a second antenna within a sectorized site, said RF signal including a plurality of scattered rays produced by multi-path scattering;

identifying a first ray from said scattered plurality of rays received at said first antenna and a second ray from said plurality of scattered rays received at said second antenna;

determining an amplitude difference and a phase difference between said first ray and said second ray;

calculating a plurality of DOA values based upon said phase difference; and

selecting one of said plurality of DOA values utilizing said amplitude difference.

16. The method of Claim 15, wherein a separation distance between said first antenna and said second antenna is greater than one-half of the wavelength of said RF signal.

17. The method of Claim 15, wherein the communication system is a code division, multiple access (CDMA) communication system.

18. The method of Claim 15, wherein said RF signal is an encoded spread-spectrum digital signal having a multiplicity of frequency and time overlapping coded signals from the remote unit and a plurality of remote units other than the remote unit.

19. The method of Claim 15, wherein said first ray and said second ray are

prompt rays.

20. The method of Claim 15, wherein determining said amplitude difference and said phase difference between said first ray and said second ray comprises:

calculating a first magnitude of said first ray;

calculating a second magnitude of said second ray; and

conducting a magnitude difference operation with said first magnitude and said second magnitude to produce said amplitude difference between said first ray and said second ray.

21. The method of Claim 15, wherein determining said amplitude difference and said phase difference between said first ray and said second ray comprises:

calculating a first phase of said first ray;

calculating a second phase of said second ray; and

conducting a phase difference operation with said first phase and said second phase to produce said phase difference between said first ray and said second ray.

22. The method of Claim 15, wherein calculating said plurality of DOA values based upon said phase difference comprises calculating a first DOA estimate.

23. The method of Claim 22, wherein calculating said plurality of DOA values based upon said phase difference comprises computing a phase calibration with said first DOA estimate and directivity data of said first antenna and said second antenna.

24. The apparatus of Claim 23, wherein calculating said plurality of DOA values

based upon said phase difference comprises computing a calibrated phase difference with said phase calibration and said phase difference.

25. The apparatus of Claim 24, wherein calculating said plurality of DOA values based upon said phase difference comprises calculating said plurality of DOA values based upon said calibrated phase difference and geometry data of said first antenna and said second antenna.

26. The method of Claim 13, wherein selecting one of said plurality of DOA values comprises conducting a comparison between said plurality DOA values and said first DOA estimate.